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Movement -- Complexities and The Operational Planner

A Monograph
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Second Term 90-91

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

AGENCY USE ONLY (*Leave blank*)

2. REPORT DATE
5/6/91

3. REPORT TYPE AND DATES COVERED
Monograph

TITLE AND SUBTITLE
Movement--Complexities and the Operational Planner.

5. FUNDING NUMBERS

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8. PERFORMING ORGANIZATION REPORT NUMBER

. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

SUPPLEMENTARY NOTES

DISTRIBUTION/AVAILABILITY STATEMENT
Approved for Public Release; Distribution Unlimited

12b. DISTRIBUTION CODE

ABSTRACT (*Maximum 200 words*)

14. SUBJECT TERMS
movement automation
operational movement
movement planning
movement spreadsheet
time/space calculations
movement tables
corps movement

15. NUMBER OF PAGES
48

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Unlimited

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18
298-102

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This monograph addresses a common experience and training deficiency for operational planners in the United States Army. This deficiency is the planning of large scale road movements.

The monograph postulates that three distinct problem areas arise for operational versus tactical level movement planning. These problems are 1) the lack of experience in conducting large scale movements; 2) the expanded data requirements associated with such moves an 3) the necessity to understand and utilize automation in order to quickly determine movement sequencing and timelines.

The monograph provides a simple paradigm for approaching movement problems. It then proffers numerous essential data elements which must be considered by operational planners. The monograph also presents an automated spreadsheet (Lotus 1-2-3 or Microsoft Excel compatible) that could be used to plan movements. It allows the planner to conduct "what if" analysis. The spreadsheet calculates movement timelines on a single sheet of paper in an easy to understand (and easy to fax) format.

Finally, the paper provides a step-by-step example (based on a given scenario) using the paradigm, data and spreadsheet previously discussed. The conclusion advises that there is an absolute need for using and understanding automation when attempting to conceptualized and plan operational movements.

Accession For
NTIS GRA&I
DTIC TAB ☑
Unannounced
Justification

By
Distribution/
Availability Codes

Dist	Avail and/or Special
A-1	

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

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Accepted this 22nd day of May 1991

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> **Generally, he who occupies the field of battle first and awaits his enemy is at ease; he who comes later to the scene and rushes into the fight is weary.**[1]
>
> **Sun Tzu, The Art of War**

This observation, rendered by the great Chinese theorist over 2000 years ago, has proven itself true throughout the recorded history of warfare. In the U.S. Army today, student exercises, map exercises and other tutorials often begin with large units waiting in position--ready for combat. Historic examples such as Patton's road march during the Ardennes Offensive, movements during the Arab/Israeli conflicts and recent experiences in Saudi Arabia, however, clearly indicate a requirement for familiarity with planning large unit movements *into* these positions.

Costs and other constraints make actual corps-size movement training exercises exceedingly expensive. Operational planners typically lack an adequate experience base when confronted with planning such activities. Furthermore, the volume of data and the need to comprehend the complex time and space relationships associated with movements of this magnitude indicate a perfect environment for the employment of simple automation.

Today, neither the Command and General Staff College nor the School of Advanced Military Studies requires any student to actually plan the movement of a corps. In addition, these schools do not provide even simple step-by-step examples--based on available doctrine and procedures and complete with adequate software--to demonstrate how to solve such a problem. This monograph will provide such an example and discuss the

relevant aspects of moving a heavy corps--the first step in understanding the art and science of operational movement.

We will begin by establishing a scenario. The scenario calls for a Corps G-3 planning officer to quickly investigate the inherent problems associated with a corps movement from a rear assembly area to a forward assembly area or defensive position. The scenario requires rest halts and refuelings on the move (ROMs). Time constraints demand quick turn-around analysis. The planner has little opportunity to integrate outside staff agencies into the <u>initial</u> planning process.

In the first chapter, I will examine US Army concepts, doctrine and procedures germane to operational movements. I will discuss the differences between operational level and tactical level movement and highlight the distinctions between operational movement and maneuver.

In the next three chapters, I will investigate the three problems that I believe a planner must examine in order to comprehend operational movement. These areas include the problem of lack of experience; the size and diversity of required data; and the time/space complexities and automation required when considering operational level movements. These chapters provide some hints to planners attempting to unravel operational movement problems such as those exemplified in our scenario.

The last chapter will exhibit a step-by-step primer, a "how to" of sorts, for the operational planner. It will provide one solution to the scenario presented. It will indicate how to apply the data and use automation, doctrine and procedures established in the previo
in order to achieve a quick and reasonable solution to our r
movement problem.

THE SCENARIO

Having recently graduated from the Command and General Staff College, you find yourself assigned as an Assistant G-3 in the 10th (US) Corps G-3 Section. An economic/geographic dispute in Southwest Asia has led to the invasion of a small country by a highly militaristic and autocratic neighbor nation. A coalition of nations dictated the deployment of several ground, sea and air forces to block "naked aggression" in the region. This joint effort includes your 10th (US) Corps. Today, the last units of the corps disembark from ships and position themselves in a staging area near the ports of debarkation.

Within the past few hours, intelligence reports indicate the mobilization of large ground forces from military bases in a previously neutral country located to the north. These sources suggest that the forces intend to direct themselves south towards allied coalition positions in the next 4 to 6 days. They have probable hostile intentions. The Corps G3, Colonel Smith, receives an urgent call from the Corps Commander. He wants to discuss the developments to the north.

Colonel Smith perceives that the command group may decide to meet this new threat by moving the 10th (US) Corps to a blocking position just north of a large oil field. Over 600 kilometers of desert lies between the present corps assembly area and the possible hostile country. Before leaving to meet with the Corps commander, Colonel Smith gives you the following guidance:

"I think we might have to move the corps to meet this new threat. Give me your best estimate on moving us to defensive positions around here (pointing to the map). Give me a rough idea of unit sequencing and the timelines required for this move. If we get going within the next 96 hours, the only asset that he has that can reach us is his air power. Get to work. Look at the problems. I should return in about three hours."

OPERATIONAL MOVEMENT - WHAT IS IT?

The operational level of command .... thinks, plans, and acts in greater dimensions regarding time and space than the tactical level of command.[2]

Operational planners typically begin with experience only in tactical level movements. Movement becomes much more complicated at operational levels. The scenario posed depicts a nightmare for any inexperienced movement planner. The impossibility of conducting a coordinated staff action in order to meet Colonel Smith's time constraints dictates the necessity for independent analytical skills by the G-3 planning officer.

In any given exercise, the "final" movement plan requires a complex coordinated staff effort--a time intensive product. Planners, however, need to establish tentative unit schedules to facilitate future mission programing. Typically, they would prefer the "90% solution" now rather than "100% solution" later. This monograph proffers a method for achieving the "90% solution" for the operational planner (or the curious student) who does not have time for a fully coordinated and detailed staff generated solution.

We began with a scenario for a time-sensitive, long distance, multi-route, multi-divisional heavy corps movement from a rear assembly area to a forward assembly area or defensive position. The move includes requirements for rest halts and refuelings on the move (ROMs). Is th operational move or a tactical move? What distinguishes the two? is a difference, what special abilities must the operational planr the tactical planner) possess in order to achieve a solution to in a timely manner? This chapter will address these que

First we must understand the purpose of operational movement. The United States Army Training and Doctrine Command (TRADOC) defines operational movement as an activity that endeavors to "regroup, deploy, shift, or move joint/combined operational formations within the theater of operations (or area of operations) from less threatened or less promising areas to more decisive positions elsewhere (i.e., the friendly position obtained relative to the enemy) by any means (joint, allied, host nation, or third country) or mode (air, land or sea)."[3] Our scenario (depicted on page 5) conforms to this definition.

Sometimes we confuse operational movement with operational maneuver. TRADOC says that operational maneuver intends to "deploy joint and combined operational forces to and from battle formations and to extend forces to operational depths for achieving a position of advantage over the enemy for accomplishing operational or strategic objectives."[4] In our particular scenario, operational maneuver could occur during a follow-on phase when, if necessary, forces deploy from battle positions in order to close with and destroy the enemy. One should understand the subtle yet distinct differences here. Operational movement secures position before battle and operational maneuver develops and exploits tactical successes to secure operational and strategic objectives.[5]

Does unit size differentiate between operational and tactical movement or maneuver? What peculiar characteristic classifies movement as operational--and not tactical? FM 100-5, Operations, sheds little light on the question. It does not address operational movement. However, it does defines operational maneuver as the

movement of forces in relation to the enemy to secure or retain positional advantage and to seek a decisive impact on the conduct of a campaign.[6] This definition does not consider unit size. Could small units conduct operation maneuver (or movement), just as long as their mission was the accomplishment of operational objectives? Perhaps they could, but I do not think so.

We tend to think of the corps as the smallest element capable of conducting operational movement or maneuver. Although scale alone does not distinguish operational movement, the complex time and distance factors associated with the planning and execution of a unit movement do.[7] The corps' size, area of operations, diversity of sub-unit structure, variety of sub-unit capability, ability to self-sustain, and characteristic planning times contribute the essential elements to satisfy this criterion. In short, the infrastructure to *orchestrate forces* on a *large scale* and over a *diverse area* sets the corps apart from lower level units. Hence, we select the corps as the smallest unit which conducts operational movement/maneuver.

With the doctrine established, we now turn to the procedures. If the distinguishing characteristic at the operational level is complexity in time and space and intricacy in planning and execution, are there different established procedures for conducting operational movement versus tactical movement? I do not think so. My analysis of corps and higher level movement procedures indicates a mere assimilation of tactical level movement procedures. Take a serie tactical moves, direct it at an operational objective, make it lar least corps size) and more complex in scale, and you have oper

movement. The doctrine may indicate differences--but the procedures do not. The underlying principles remain the same.

Should we have different methodologies and procedures for conducting movements at the different levels of war? With few exceptions, I believe not. Complex movement concepts require conformity and consistency. One engages in movement at the operational level and movement at the tactical level for essentially the same reasons. Therefore, the thought processes and methodologies behind one should reflect and conform to the thought processes and methodologies behind the other. Fortunately, our procedures accomplish this.

Since procedures remain relatively constant, tactical movement planners should have little difficulty shifting from the tactical level and readily grasping the fundamentals of operational movement planning. Correct? I believe so, with three very important exceptions. These exceptions are the problems of 1) experience; 2) the size and scope of the required data and; 3) the complexity of the time/space movement relationships. Planners must somehow overcome these factors in order to tackle operational level movement. This monograph devotes the next three chapters to providing insight into these three problem areas.

THE EXPERIENCE PROBLEM

Experience is the best guideline for the length of march and the time it will require.[8]

Carl Von Clausewitz, *On War*

The United States Army suffers from a lack of experience in operational level movement planning. Few planners have had the benefit of formulating and conducting full scale corps-level movements. Since the Ardennes Offensive of 1944, none have done it "on the fly".[9] Those who do have any experience typically find themselves assigned to the Corps Movement Control Center (MCC)--not the G-3 plans section. Responsibility for most *detailed* corps movement planning and programming resides with the MCC.[10].

One would certainly regard the Movement Control Center's expertise as invaluable and planners should seek MCC assistance as soon as possible. But, as the name implies, MCC responsibility lies in *controlling* the move. The responsibility for conceptualizing the move resides with the commander and his operations section.[11] The planner is responsible for maintaining estimates of current and future operations.[12] He must establish the initial guidelines for all moves. He must adjudicate orders of march and have some idea of starting and closing times in order to facilitate future planning of moving units.

But he finds himself in a dilemma. He probably lacks familiarity with movements at the operational level. His tactical experience base will not adequately compensate for this particular scenario. He knows how to march tactical units, but large scale moves over long distances in unfamiliar terrain require numerous time/space

calculations. He needs answers, but he cannot afford to wait for the *detailed* answers that other staff agencies will eventually provide. He has much planning to do. He has many activities to coordinate and numerous warning orders to promulgate. Movement times seem to dictate virtually all of his future operational planning. In short--he needs a solution to the movement problem.

But how does he get one? Although incapable of quickly formulating *detailed* movement plans, operational planners must possess proficiency in building "straw man" plans for any move. This exemplifies the essence of working at the operational level--the ability to conceptualize large problems, devise adequate solutions, portray essential information and move on to subsequent planning.

The initial plan, although not perfect, should establish those key elements of information (unit locations, number of refuelings, proposed vehicle densities, closing times, etc.) required for future planning. It should also establish a framework for future coordination among the various subordinate commands and staff agencies. As with any process, planners cannot afford to rely on involved procedures that significantly diminish the time available for subsequent planning. Time becomes the decisive variable. Time will dictate the complexity of any plan.

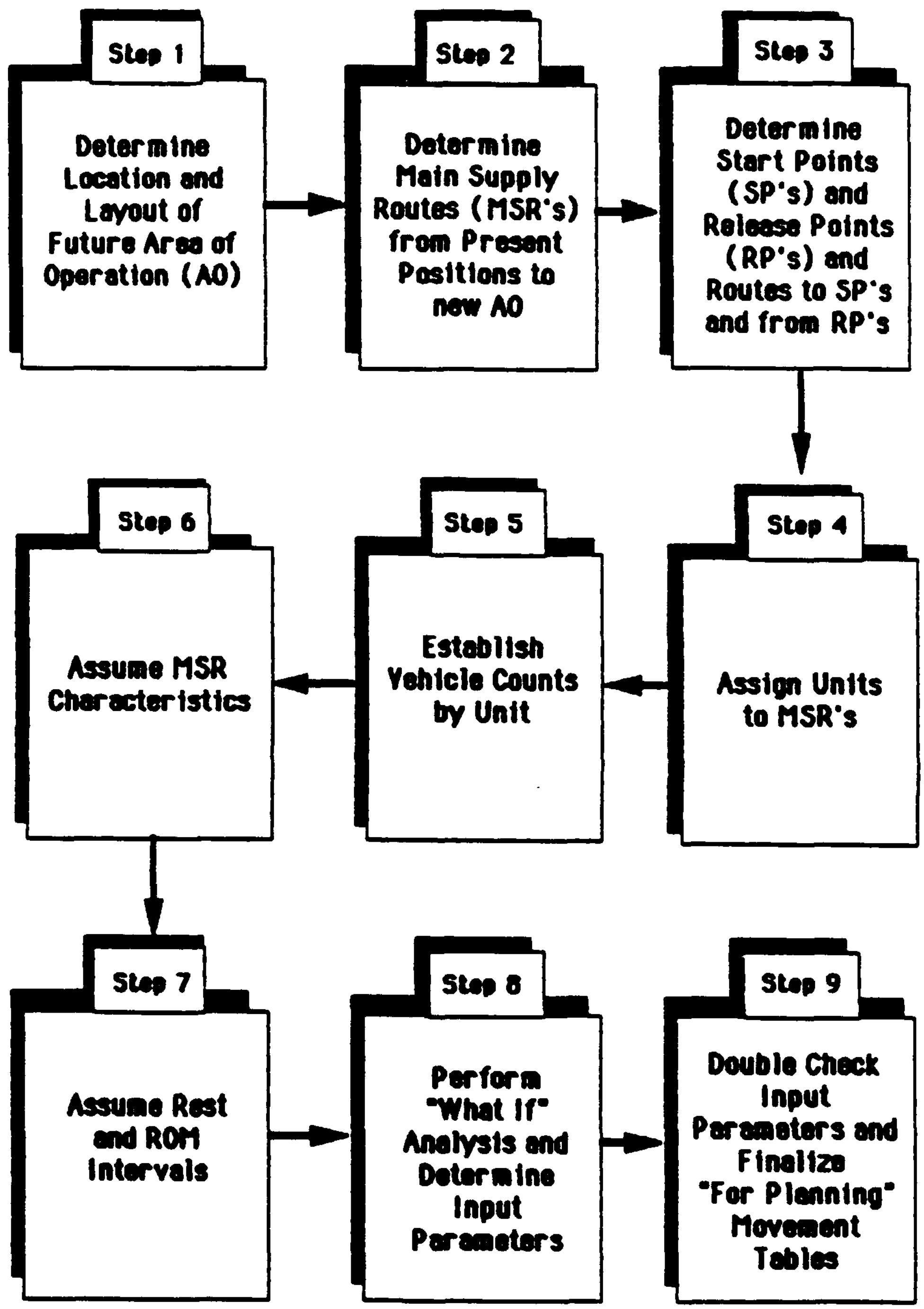
I believe that the U.S. Army has not adequately prepared itself for operational movement planning. At the operational level, it must develop planners who can formulate high quality movement plans given sufficient time--*and reasonable quality movement plans in a short amount of time.* Today, our school system concentrates on neither.

How does one go about developing an initial solution to a movement problem? Given our scenario in this monograph, what first step and subsequent steps should the G-3 planner take? This chapter presents a proposed model to derive quick solutions to movement problems--large or small. The model is generic and presented in flow chart format. Planners attempting to build "straw man" movement plans may find value in this model. Common sense dictates most of the process. The planner needs an easy-to-follow model when quickly searching for the 90% solution. With timeliness and simplicity as the goal, a more hermetic model could be too complicated and, therefore, counter-productive.

Figure 1 outlines the approach. The approach depicts a process or procedure to assist the operational planner in sequencing his resources into the proper place at the proper time. This sequencing of resources towards operational objectives defines operational-level planning. Large unit movements clearly exemplify the necessity for understanding how to sequence resources. These exercises highlight the expanded data requirements and complex time/space factors inherent in and defined by operational movement planning.

The next two chapters will discuss the details of each node of the approach. Although the best answer to lack of familiarity lies with experience, one cannot derive experience from reading a monograph. However, we can supplement a lack of experience by establishing a framework for movement planning and providing an organizatir outline for attacking movement problems. The approach pro such a framework.

FIGURE 1 - THE APPROACH *



* As with virtually all military operations, planners must consider the factors of METT-T during each step of the approach.

THE DATA PROBLEM

> **The years since the end of World War II have seen the US Army twice engaged in large-scale combat, but in neither case did we place a heavy corps on the offensive. We forgot the lessons and techniques of World War II. As the Army settled into its postwar environment, we saw corps in Europe take up a defensive role and doctrine changed accordingly.**[13]

When one considers that moving a *single* corps *actually* represents the *lower* end of the operational movement spectrum, and that an operational campaign may involve the movement of several corps, armies or army groups--individually or simultaneously--then the problem of operational movement expands to one of proportions rarely witnessed in modern history.

Problems of this magnitude require a clear understanding of the fundamentals of movement. This monograph could not attempt to establish every relevant component of doctrine or every pertinent element of data concerning movement. This chapter will, however, establish a base line of knowledge for the G-3 planner working in this area. Current references, common practice and historical examples will support analytical conclusions. I will also highlight areas for improvements in doctrine, procedures and data concerning the movement of a heavy corps.

Keeping track of the data at corps level becomes much more difficult than at subordinate levels. Many more units, vehicles, factors and figures demand consideration. In order to begin to attack the movement situation and develop a "straw man" for planning at the corps level, one must strive to seek and evaluate only the essential elements of the problem. Success springs from simplicity, sound

judgment and knowledge of the numbers. The remainder of this chapter will develop these data.

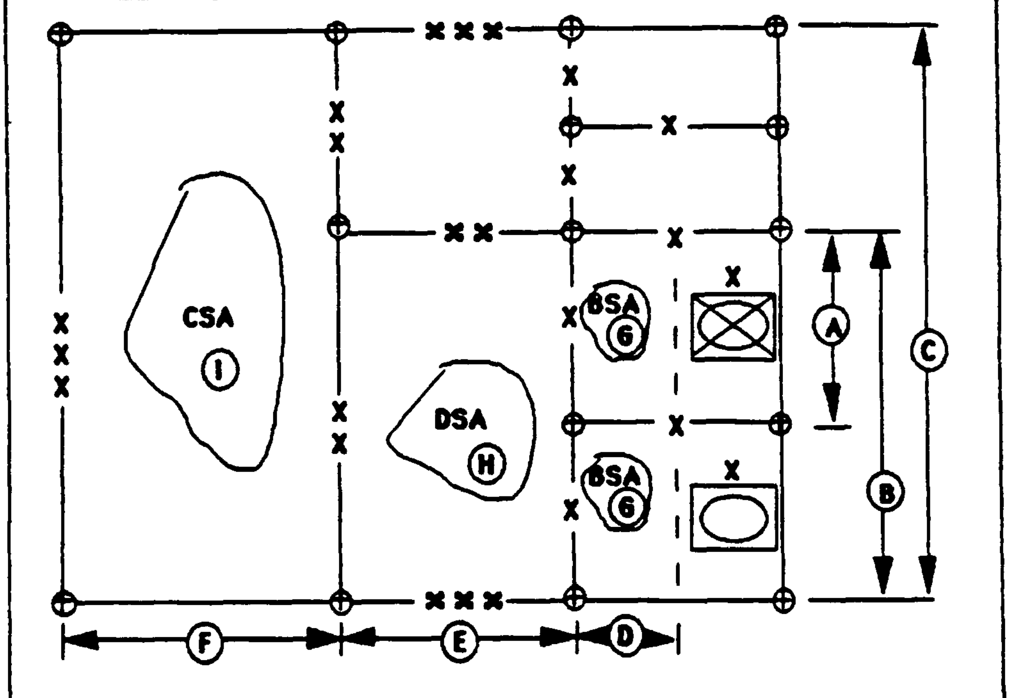
The discussion will follow the approach as presented on page 13. Step-by-step, we will discuss data relevant to planning a corps move. One should consider the data only as a general (and usually generic) guide for attacking large scale movement problems.

Step 1--Determine Location and Layout of Future Area of Operation[14]. In order to move, one must first have a place to go. To facilitate the backward planning process, the planner must first determine the location and layout of the future area of operations. No correct pre-ordained answer exists for the size, location or layout of the corps. Obviously, you will want to find a position that will arrange your forces in a manner most conducive for their tactical employment against the enemy. This constitutes the foremost consideration of your movement plan.[15]

Generally, at the tactical level, higher headquarters provides unit boundaries and locations. At the operational level, however, you may find yourself at the higher headquarters. You might have to determine the future area of operations. As with tactics, find optimal terrain for mechanized forces, light forces, etc.

Although this may seem apparent, conspicuous examples of operational planning throughout the history of warfare suggest otherwise.[16] Figure 2 supplies a few helpful hints for locating and placing various sized units of concern to corps planners. This figure provides only generic reference data derived from doctrinal manuals and other reference materials. As always, mission, enemy, terrain, time and troops available (METT-T) analysis provides your best guide here.

FIGURE 2 - TERRAIN REQUIREMENTS



ARROW	NAME	OFFENSVE	DEFENSIVE
A	Brigade Front	3-5 km[17]	20 km[18]
B	Division Front	10-15 km[19]	60-100 km[20]
C	Corps Front	20-30 km[21]	200-300 km[22]

ARROW	NAME	LENGTH
D	Brigade Depth	15-20 km
E	Division Depth	35-45 km
F	Corps Depth	170-190 km

AREA	NAME	LENGTH
G	Brigade Support Area	3 km x 4 km [23]
H	Division Support Area	7 km x 7 km [24]
I	Corps Support Area	Numerous Base Clusters

<u>Step 2--Determine Main Supply Routes (MSR's)</u>[25] <u>From Present Positions to New Area of Operation.</u> If you have no MSR's, you have major problems. You will probably have to readjust your plans. A few routes might present some difficulties. More routes provide more

flexibility in planning. As we will see in the next chapter, the number of routes depends on the number and types of units you wish to move and the time frame that you wish to move them in. Route selections will most likely come from a map analysis or through querying the Maneuver Control System (MCS).

De-confliction plays a major part when selecting MSR's. Everybody wants to use a good road. The pros and cons of working in mature versus immature theaters become apparent here. Mature theaters tend to have good road systems--with many people wanting to use them. Immature theaters tend to have fewer of both. Unlike many smaller units, corps do not possess 100% organic mobility. Line haul[26] becomes particularly necessary at the corps level and one must consider it early in the basic plan! Consider dedicating one MSR to this critical activity. See Figure 3 for critical items to check when selecting MSR's.

FIGURE 3 - MAIN SUPPLY ROUTE SELECTION [27]
<u>CRITICAL ITEMS</u> • REDUCTIONS IN OVERHEAD CLEARANCE (VEGETATION, OVERPASSES, ETC.) • REDUCTIONS IN ROAD WIDTH (TUNNELS, BRIDGES, BUILDINGS, ETC.) • REDUCTIONS IN ROAD CAPACITY (BRIDGES, FORDS, FERRIES, ETC.) •STEEP GRADES (7 PERCENT OR GREATER) • SHARP CURVES (RADIUS LESS THAN 30 METERS) • WEATHER RESTRICTIONS (ICE, SNOW, MUD SLIDES, ETC.) • NBC CONTAMINATED AREAS

Step 3--Determine Start Point and Release Points and Routes to Start Points and from Release Points. First select start points and release points. Follow the route (s) from the newly proposed unit locations back to a logical release point (RP's)[28] on the MSR's. Find a practical start point[29] and establish routes back to present unit locations. These become your MSR "feeder routes". Obviously, this procedure applies to both the tactical and operational level.

Ensure that good road systems exist. Attempt to de-conflict, as much as possible, multiple unit usage on feeder roads in and around the old and new positions. At the operational level, with the increased size and scope of the movement problem, de-confliction becomes much more difficult. Keep the movement as simple as possible. Figure 4 provides hints for these "feeder route" selections. Suggestions for MSR selection (Figure 3) also apply here.

FIGURE 4 - FEEDER ROUTE SELECTION[30]
CRITICAL ITEMS • MEETS CRITERIA FROM FIGURE 3 • CONVERGES ON MAIN SUPPLY ROUTES • SUITABLE ACCESS INTO AND OUT OF ASSEMBLY AREAS • SP AND RP SHOULD BE WELL-DEFINED TERRAIN FEATURES • PROVIDES ADEQUATE SPACE FOR PULL-OFF & HALTS • PROVIDES PROTECTION (COVER/CONCEALMENT) AT HALT AREAS

Step 4--Assign Units to MSR's. With some luck, the layout units in their present position will efficiently feed into the mr route and the most direct MSR to support your dispersal or their future positions. But few planners encounter such

units may have to travel on certain routes while other units have options. Keeping lines of operations and lines of communications untangled remains the objective.

Do some quick de-confliction. If the plan looks totally infeasible, you may have to change the layout in Step 1. Keep track of those units that can "float" to more than one route (when performing the "what if" analysis in Step 9, these floaters become useful). Changes may or may not come easily. The plan could require major adjustments--or merely the substitution of like-type units (e.g., substituting brigades from different divisions in order to facilitate ease of movement from one point to the next). In any event, the primary consideration lies in the positioning of he forces in the new AO (Step 1). This positioning takes precedence over ease of movement out of present locations.

Step 5--Establish Vehicle Counts by Unit. This step calls for many assumptions--especially in a time crunch. There exists no substitute for an up-to-date data base which can provide this information in a timely manner. G-3 planners should have ready access to it. If certain details do not exist, make educated assumptions.

At the corps level, you look primarily at brigade-sized units and larger. Little utility exists in trying to pin an exact number of vehicles on such large sized units this early in the planning process. The numbers will undoubtedly change. Make your best guess and go forward with the planning process. Figure 5 furnishes some useful factors that operational planners should find helpful.

FIGURE 5 - VEHICLE COUNT BY UNIT[31]	WHEELS	TRACKS	TOTAL	COMMENTS
ARMOR DIVISION				
ARMOR BDE	522	382	904	2 AR, 1 MECH, HHC, FSB, ADA, ENG
ARMOR BDE	522	382	904	2 AR, 1 MECH, HHC, FSB, ADA, ENG
BALANCED BDE	632	499	1131	2 AR, 2 MECH, HHC, FSB, ADA, ENG
CAB	222		222	
DIVARTY	476	250	726	3 -155 BN, TAB, MLRS
DIV TRPS	672	139	811	MI, SIG, ADA(-), ENG(-), CAV, ETC
DISCOM	498	4	502	
HHC	59	5	64	
TOT-ARM DIV	**3603**	**1661**	**5264**	
MECH DIVISION				
ARMOR BDE	522	382	904	2 AR, 1 MECH, HHC, FSB, ADA, ENG
MECH BDE	539	400	939	1 AR, 2 MECH, HHC, FSB, ADA, ENG
BALANCED BDE	632	499	1131	2 AR, 2 MECH, HHC, FSB, ADA, ENG
CAB	222		222	
DIVARTY	475	250	725	3 -155 BN, TAB, MLRS
DIV TRPS	672	133	805	MI, SIG, ADA(-), ENG(-), CAV, ETC
DISCOM	498	4	502	
HHC	58	5	63	
TOT-MECH DIV	**3618**	**1673**	**5291**	
CORPS ARTY				
FA BDE	377	214	591	(2-155 BN, 1-203 BN)
FA BDE	377	214	591	(2-155 BN, 1-203 BN)
FA BDE	377	214	591	(2-155 BN, 1-203 BN)
FA BDE	443	80	523	(2-LANCE BN, 1-MLRS BN)
TOTAL-ARTY	**1574**	**722**	**2296**	
OTHER CORPS ASSETS				
ACR	1023	561	1584	
ADA BDE	637	102	739	(2 CHAP BN, 2 HAWK BN, 2 HHB)
ENG BDE	1705	92	1797	(5 CBT BN, 1 HVY BN, OTHER CO'S)
MI GP	367	7	374	(AERIAL XPLT &TAC XPLT & OP BN)
SIG BDE	1103		1103	(3 AREA SIG BN, RDO BN, ETC)
CHEM BDE	305	69	374	(RECON & 2 DECON & 4 SMOKE CO)
MP GRP	335		335	(2 MP BNS)
CORPS HHC	24	3	27	
LT INF DIV	1817		1817	(LT BDE-PLAN 200, INCLUDES SLICE)
TOTAL-OTHER	**7316**	**834**	**8150**	

Step 6--Assume MSR Characteristics. Assuming MSR characteristics includes such items as route speeds, rest intervals, serial and march unit interval times, etc. This calls for sound military

judgement. What type of average movement speed can the force maintain in daylight, night or bad weather? Can the road handle two-way traffic or one-way traffic only? How many vehicles per march unit or how many march units per serial should you plan for?

Data in Figure 6 will help you here, as will the automation presented in the next chapter. The spreadsheet allows the planner to easily change assumptions. It immediately presents the results. Assuming best case and worst case provides bounds on the solution. Assuming the most probable case gets you a "most likely" answer.

Remember, at the operational level, you will want to move *a lot* of vehicles. A planner might get away with closing an entire MSR for exclusive move rights of a brigade, or even a division. But to move a corps, one must consider the impact on other military units or civilian populations in the area. Consider time intervals between serials or march units. This increases spacing and should allow cross-traffic movement and indigenous utilization. Although doctrine might not call for this, the idea deserves consideration.

Also realize that the movement of wheeled vehicles may not constitute the critical time or planning factor in an operational move. The movement of tracked vehicles may constitute your biggest and most time consuming problem. If you road march the tracks, you must consider the wear and tear on both the tracks and the roads. Transporting the tracks requires much planning and coordination of scarce line haul assets. This will all become apparent as you grapple with the numbers. The bottom line for step 6--realize the size and scope of your problem and tailor your judgements accordingly.

FIGURE 6 - GENERAL DATA FOR MSR ASSUMPTIONS
<u>GENERAL</u> NAME EACH ROUTE ENSURE NAMES DO NOT CONFLICT WITH PHASE LINES, OBJECTIVES, ETC. DETERMINE LENGTHS BETWEEN SP AND RP IN KILOMETERS
<u>MARCH SPEEDS</u> [32] LIGHT & ROAD DEPENDENT PLAN ON 30 KM/HR DURING THE DAY PLAN ON 25 KM/HR AT NIGHT
<u>INTERVALS BETWEEN VEHICLES</u> [33] DEPENDENT ON DESIRED VEHICLE GAP AND METT-T PLAN ON 25 METERS IN A CLOSE MARCH FORMATION PLAN ON 50 TO 100 METERS IN A OPEN MARCH FORMATION
<u>TIME GAPS BETWEEN SERIALS AND MARCH UNITS</u> [34] DEPENDENT ON DESIRED ROAD CLEARANCE TIME[35] AND METT-T PLAN ON 2 MINUTES BETWEEN MARCH UNITS PLAN ON 5 MINUTES BETWEEN SERIALS TIMES SHOULD INCREASE IF MOVING LARGE CONVOYS ON CONGESTED ROUTES
<u>EXTRA TIME ALLOWANCE (EXTAL)</u>[36] DEPENDENT ON TRAINING AND EXPERIENCE LEVEL OF UNITS PLAN ON 1 MINUTE PER MARCH UNIT [37]
<u>SERIAL AND MARCH UNIT SIZE</u>[38] PLAN ON 6 TO 10 MARCH UNITS PER SERIAL PLAN ON 20 TO 30 VEHICLES PER MARCH UNIT

<u>Step 7--Determine Rest and Refuel on the Move (ROM) Intervals.</u> Operational moves, because of the size of the units invol and their propensity to cover extended areas, tend to last longer

go farther than tactical moves. This time and space factor complicates planning. Doctrine calls for ROM's and rest halts which planners must explicitly address. Doctrine or standard practice constitutes the best starting point and automation helps by providing quick answers to a variety of inputs. The last chapter of this monograph will discuss automation more thoroughly. Figure 7 establishes some guidelines, but room exists for a variety of judgement calls. The biggest point to be made here is to ensure that they are included in the calculations.

FIGURE 7 - REST AND ROM CHARACTERISTICS

REST HALTS[39]

ALSO KNOWN AS MAINTENENCE HALTS
SCHEDULE 15 MINUTE REST HALT AFTER 1ST HOUR OF MARCH
SCHEDULE 10 MINUTE REST HALT EVERY 2 HOURS THEREAFTER
HALTS CAN BE SCHEDULED BY TIME OR BY ROUTE LOCATION

Rι 1S

VISUALIZE THE CONDUCT OF ROM OPERATIONS
TACTICAL VEHICLES CAN TRAVEL OVER 300 KM BEFORE REFUELING[40]
PLAN ON REFUELING EVERY 200 KM AND/OR JUST PRIOR TO OR AFTER RP
ONE MARCH UNIT REQUIRES APPROXIMATELY 30 MINUTES TO REFUEL

Step 8--Perform "What If" Analysis. The beauty of automation lies here. Automation will give you feasibility limits. It will establish the boundaries of any assumed MSR characteristic input parameters from Step 6 or 7--and will do so instantly. What speed must one travel in order to move a particular brigade only at night? How many brigades can you move during that night? What if you increase or decrease the rate of march? If one takes risk by stretching out ROM intervals, how many more vehicles can one move? What distinguishes optimal

parameters? A planner must possess the ability to *rapidly* perform this analysis. Anything less wastes planning time. I will dedicate the entire next chapter to this important procedural step.

Step 9--Double Check Input Parameters and Finalize the "For Planning" Movement Table. Once you have delineated your parameters, double check for correctness and completeness. Are the start times reasonable? Do the rates of march make sense? Have you considered an adequate extra time allowance (EXTAL) for the training level of your units? Overall, does the plan pass the "make sense" test?

The software program will print a preliminary movement table for you. You should consider it adequate for planning. Based on doctrine, the plan's utility derives from the fact that you now have a general idea of a feasible solution. No perfect or exact solution exists. Better solutions will evolve with time as you re-look, staff and coordinate. But you have achieved an intermediate goal. By the time Colonel Smith returns from his meeting with the Corps Commander, you at least have a working document as a basis for future considerations by the operational decision maker.

THE TIME/SPACE PROBLEM AND AUTOMATION

> **Assuming the corps has three divisions, an ACR, and supporting troops, it would move about 25,000 vehicles. It would occupy road space of 2,500 kilometers if it marched at the normal interval of 100 meters between vehicles (10 vehicles per kilometer) even without gaps between march units and serials. Corps pass time at 25 kilometers per hour would be more than 4 days.**[41]
>
> **FM 100-15, Corps Operations**

We now address the final discriminating characteristic of operational movement--complex time/space relationships. This complexity defines operational movement and sets it apart from tactical movement. Many experienced officers intuitively know the requirements and approximate time lines for moving tactical units short distances. Moving corps over long distances presents an entirely different proposition.

Knowing that a corps of 25,000 vehicles will stretch for 2500 kilometers on one route at a certain march unit and serial time gap has little utility if your particular problem possesses none of these characteristics. Planners attempting to extrapolate useful details from such gross tidbits of information waste valuable planning time. The answer lies with automation. This chapter will address this fundamental issue.

We will introduce an automated, easy-to-use spreadsheet for the operational planner. The spreadsheet provides the planner the ability to perform quick turn around ("what if") movement planning and analysis. The operational planner should consider spreadsheet utilization. Spreadsheets perform complex time/space calculations quickly and correctly--leaving the planner valuable time to perform other essential

tasks. The Command and Control Microcomputer Users' Group, C^2MUG, will have copies of the software discussed in this chapter.

The key to analyzing and interpreting large scale time/space relationships lies in the performance of "what if" analysis. The G-3 planner, when building his straw man movement plan, must remain cautious of trying to handle too much data and investigating too many attributes--many of marginal utility. He should keep the big picture in sight. The automation can overload the analyst with reams of useless data. He works at the operational level; therefore he seeks general clarity, feasible bounds and most likely courses of action to broad, complex problems.

By following the nine basic steps as outlined in the approach on page 13, operational planners can arrive at a solution to virtually any movement problem. However, to do it quickly and to derive the feasible bounds of his particular problem, he must use automation.

This represents a significant failure in the U. S. Army's educational process for its operational planners. Its schools do not provide automation training or software support to perform operational movement planning. The software provided by the Command and General Staff College and C^2Mug is inflexible, unfriendly and of marginal utility for planning even a small unit movement. It is so difficult to use that it actually discourages automation use by students.

To overcome this important shortfall, I have developed a software program for use on Microsoft Excel or Lotus 1-2-3 (two common and readily available commercial spreadsheets for use on Macintosh or IBM compatible personal computers) to help the planner

determine movement timelines. Spreadsheets allow the planner to interact, change assumptions and *instantly* evaluate the results.

In my opinion, the operation planner, when attempting to build a straw man movement plan, must look at about two dozen items of interest when determining the viability of a move. He must adjust a handful of input parameters to set the move within the bounds of feasibility. The next chapter fully discusses the manipulation of these parameters.

Figure 9 depicts the spreadsheet. The first 12 and last 10 italicized and underlined items (2nd column of lines A - L and first four columns of lines 1 -10) represent the input parameters manipulated by the planner. Original inputs come from assumptions made during Steps 6 and 7 (previous chapter). Contemporary procedures or doctrine dictate most of these initial assumptions.

The planner's most important item of interest is time. In particular, what time must a unit begin movement and what time will it complete movement. If the time-lines (lines 1 - 10, last three columns) derived from initial inputs prove infeasible, the spreadsheet allows the movement planner to change the inputs and update the movement table.

For instance, in figure 9, the planner determines that the last vehicle on this day must cross the RP no later than 0640 hours. Presently, the last vehicle of the 23rd Armored Division Advance Party crosses at 0945 hours. The planner can either increase the convoy speed, decrease the time between serials, start the movement earlier, decrease the total number of vehicles, decrease the route length, or any combination of the above to achieve a possible

FIGURE 8 - THE SPREADSHEET

INPUT DATA FOR ROUTE: AS OF 18:40 3-May

A.	ROUTE NAME:	EAST	
B.	ROUTE LENGTH:	260	KM
C.	START TIME OF FIRST VEHICLE:	18:00	HRS 9-May
D.	AVERAGE MARCH UNIT SPEED:	25	KM/HR
E.	AVERAGE INTERVAL BETWEEN VEH:	50	MTRS
F.	TIME AT REST HALTS:*	10	MINS
G.	TIME BETWEEN REST HALTS (AFTER 1ST HOUR):	2	HRS
H.	TIME AT ROM HALTS:	30	MINS
I.	DISTANCE BETWEEN ROM HALTS:	200	KMS
J.	TIME GAPS (BETWEEN SERIALS):	5	MINS
K.	TIME GAPS (BETWEEN MU's):	2	MINS
L.	EXTRA TIME ALLOWANCE (EXTAL):	2	MIN/25 VEH.

* A 15 MIN REST HALT IS AUTOMATICALLY COMPUTED AFTER THE 1ST HOUR

INFORMATION FOR ROUTE: EAST

M.	TRAFFIC DENSITY WITHIN MARCH UNIT:	20	VEH/KM
N.	NUMBER OF REST STOPS ON ROUTE:	4	
O.	NUM. OF REFUELING STOPS (ROMS) ON ROUTE:	1	
P.	TOTAL DRIVING TIME PER VEHICLE:	10:24	HRS:MINS
Q.	REST AND/OR ROMS HALTS PER VEHICLE:	1:15	HRS:MINS
R.	TOTAL TIME OF TO CLOSE PER VEHICLE:	11:39	HRS:MINS
S.	TOTAL NUMBER OF SERIALS ON ROUTE:	4	SERIALS
T.	TOTAL NUMBER OF MARCH UNITS ON ROUTE:	34	MUs
U.	TOTAL NUMBER OF VEHICLES ON ROUTE:	858	VEHICLES

	UNIT	NO. SER	NO. MU	NO. VEH	TOT VEH	SP TIME	1ST VEH RP	LAST VEH RP
1.	208 AVN SQN	1	4	30	120	18:00	5:39	6:09
2.	3/208 ACR	0	3	22	66	18:32	6:11	6:28
3.	208 MI CO (-)	0	1	25	25	18:51	6:30	6:35
4.	208 ADA BTY (-)	0	1	25	25	18:58	6:37	6:42
5.	208 SPT SQN (-)	1	6	25	150	19:08	6:47	7:27
6.	208 CHEM CO	0	1	19	19	19:50	7:29	7:33
7.	208 ENG CO	0	1	28	28	19:56	7:35	7:40
8.	500 ENG BN(DS)(-)	0	2	25	50	20:03	7:42	7:54
9.	208 FA BN	1	7	25	175	20:20	7:59	8:46
10.	23 ARM ADV. PRTY	1	8	25	200	21:12	8:51	9:45

COMMENTS:

solution. The spreadsheet allows him to combine his knowledge of doctrine and procedures with common sense to achieve a rapid answer to his particular problem. No other movement software program presently available through the Command and General Staff College or C^2MUG allows planners to perform these types of changes.

The spreadsheet produces a one page, easy to understand (and easy to fax) movement table. Appendix A of FM 55-10, Movement Control in a Theater of Operations, also publishes a (twelve-step) method for developing movement tables. It provides a movement scenario and solves it. Remember, this manual represents theater level doctrine. The movement depicted in this manual's scenario consists of 679 vehicles organized into 5 serials and 31 march units.

The doctrine suggests that the planner must determine items such as movement rates, vehicle densities and time gaps **before** beginning the movement plan. It then solves the movement problem, based on these **unchangeable** variables, by numerous hand calculations and plotting different serials on graph paper. Many parameters that need to be calculated, such as march unit length and road space per serial, are of little utility to the operational planner. After doing all of this, the planner derives SP and RP times from the graph paper. If George Patton's operations section utilized this method to plan the move of the Third Army during the Ardennes Offensive of 1944 (a total of just over 9,000 vehicles), it would be little wonder that they only managed to issue a one page directive after three days of planning (which, by the way, was issued on the second day of the three day move!).[42]

A problem exists with our doctrine and our training if we rely on these types of procedures at the operational (and even at the tactical) level. Attempting to follow these procedures squanders the planner's most valuable and non-retrievable asset--time. This time loss becomes magnified when one considers that, at the operational level, planners typically desire to know only general SP and RP times so that future planning and sequencing of units can be accomplished.

The next chapter will discuss the spreadsheet presented in figure 9 in greater detail. It will do so by plodding through one solution to the scenario presented at the beginning of the monograph. It will use automation to derive a solution. It will not require the planner to plot anything on graph paper. It will allow him to change input assumptions and derive results instantly.

Speed remains the key to success when performing "what if" analysis and "what if" analysis contributes immeasurably towards developing a viable plan. This analysis provides the operational planner (and, ultimately, the operational decision maker) with discrete yet realistic alternatives. One must perform this analysis quickly and correctly. It is my fixed opinion that current doctrine requiring numerous calculations and graph paper plotting is much too slow for the operational planner--dealing with thousands of vehicles and hundreds of march units--to be of any utility whatsoever.

A SOLUTION TO THE SCENARIO

> **... threw by strategic movements the mass of an army, successively, upon the decisive points of a theater of war, and also upon the communications of the enemy as much as possible without compromising one's own.** [43]
>
> **Antoine Henri Jomini, *The Art of War***

This chapter provides one solution to the scenario presented in this monograph. One should not conclude that this discussion represents the "approved" or "schoolhouse" solution to the movement problem. I provide it merely to illustrate and highlight the methodologies, techniques and use of data elaborated in the previous chapters. The following discussion depicts the hypothetical outcome of the scenario presented on page 5.

As soon as Colonel Smith departs, you huddle with two other staff officers, Major Green and Major Brown. The three of you will develop the initial "straw man" plan for this move. This will become the G-3 conceptualization of the move. The plan will provide other staff agencies with the initial G-3 view of how to coordinate, conduct and further plan the move. It will denote general locations, sequencing and time-line information. You also contact two other planning officers. Major Williams of the G-2 section is brought in to calculate enemy capabilities and keep the group appraised of any enemy actions that might affect the move. Major Johnson of the G-4 plans section prepares to provide the group with quick turn-around analysis concerning corps line-haul capabilities for tracked vehicles.

You divide the responsibilities according to the outline in the approach on page 13. Major Green will develop step 1. Major Brown will assist him and concentrate on steps 2, 3 and 4. You warm up your computer and busy yourself with the data collection for steps 5-8.

Major Green, after consulting with Major Williams concerning enemy capabilities, develops a corps map overlay of possible unit positions. Lacking guidance from higher headquarters, he relies on his knowledge of doctrinal planning factors (figure 2, page 16). In accordance with COL Smith's directive, he plans to have the corps assume defensive positions approximately 70 kilometers north of a large oil field complex. He describes the terrain as a virtual billiard table, but a few very minor hills and wadies in the area provide some relief and possible protection. The position represents the best in the area. The boundaries, although workable, certainly stretch the limits of the typical doctrinal template. The corps covers a very large area.

Having an established place to go, Major Brown finalizes his choice of main supply routes. A map reconnaissance indicates only three likely candidates. Working with Major Green, Major Brown ensures that BSA, DSA, CSA and other critical unit positioning takes advantage of these routes during the overlay development of step 1. The route in the center was the best, a four-lane MSR. Major Brown names it ROUTE CENTER. The other two routes (ROUTES WEST and EAST) proved of lesser quality but usable.

All routes possess numerous turn-offs for rest and refueling stops, transfer roads for lateral movement between routes and good feeder routes into RP's and SP's. Oil drillers built most of these routes.

Designed to carry oil field equipment, they bear great strength, especially on those few bridges over dry creek beds and wadies.

Major Brown decides to dedicate the center route strictly for line haul and back haul use. In most tactical moves, tracks and wheels move together. In operational moves over long distances, however, one must consider transporting tracked vehicles and slow moving wheeled vehicles (cranes, graders, fork lifts, etc) on Heavy Equipment Transports (HETs), lowboy trailers, rail cars, barges, etc. Working in a relatively undeveloped theater, this type of transportation will likely define the limiting factor on corps closure time. If the time and situation allows, dedicating the best (and shortest) MSR to this type of movement represents one technique of solving the problem.

A terrain analysis conducted by Major Green indicates that the eastern sector better suits armored units while the western sector better suits infantry units. Major Green' concept of the defense visualizes an infantry division on the left, an armored division on the right, an armored division in reserve and the armored calvary regiment in the security area to the front.

Major Brown, keeping the concept of the defense uppermost in mind, now begins assigning specific units to specific MSR's. This entails an accounting process to ensure that every unit secures a route assignment. All units receive due consideration and acquire terrain and MSR assignments according to their needs (such as near pipelines, roads, airfields, etc.). Some de-confliction becomes necessary--especially in getting out of the rear assembly area. All in all, however, the movement seems feasible and Major Brown approaches you with his tentative idea of how to assign units to MSR's.

You complete data collection for steps 5 through 8. Last night's briefing for the corps commander provided the details you need for step 5. You now possess the vehicle count by unit. (For illustrative purposes, we will assume 100 % fill and 100 % operational readiness rates and use the data presented in figure 5 on page 20). You and Major Brown sit down with your software program to solve the time/space relationships associated with this particular operation and establish tentative movement schedules to facilitate future planning.

You decide to move the armored calvary regiment first. Three reasons dictate this. First, the regiment can assume guarding positions for ground and aerial protection of follow-on forces. Second, it occupies positions to the front (and furthest away) and moving it first eliminates the necessity of moving through other corps units. Finally, the ACR portrays a "mini" division with above average movement training and expertise. Moving it first allows you an opportunity to "work out the bugs" and adjust plans for follow-on units.

You decide to move the wheeled vehicles of the ACR on the outside routes (EAST and WEST) and the tracks by line haul assets on ROUTE CENTER. Movement includes a direct support artillery battalion and a direct support engineer battalion that usually accompany the regiment on these types of missions. You also tag-along advance parties for follow-on divisions which will use these routes on subsequent moves. For additional protection and security from the main thread (a relatively unsophisticated enemy air force), you decide to try to make the wheel movement entirely at night.

Knowing that the ACR plus attachments possess about 656 tracked vehicles[44] requiring transport to the future area of operations,

you quickly contact Major Johnson in the G-4 plans section. You relay your initial tasking for transportation to him in order that he may begin parallel planning. Luckily, the theater has made a concerted effort to employ numerous active and reserve heavy truck companies for theater support.[45] Each company consists of 24 HET trucks and enough drivers to work two shifts per day.[46]

Major Johnson established a priority for movement in accordance with your concept. With two shifts per day using ROUTE CENTER and utilizing HETs from a few theater, all COSCOM and all divisional heavy truck companies, Major Johnson believes that the ACR movement can be supported. (Although beyond the scope of this monograph, this type of support planning also lends itself well to simple automation).

You continue to concentrate on wheeled vehicle movement and the sequencing of units into the proposed area of operations. You divide the ACR's 1736 wheeled vehicles[47] onto the remaining two routes. Figure 9 depicts the movement on ROUTE WEST, which we will discuss in this chapter. (To see the ACR wheeled vehicle movement on ROUTE EAST, see figure 8 on page 28). Using figure 6 on page 22, you break the units into standard-sized march units and serials. You choose mostly routine input parameters.

A night move indicates a choice of a 25 km/hr rate of march and a 50 meter march interval (figure 9, lines D and E). The low number of vehicles coupled with the relative lack of indigenous and other military traffic on these routes indicate that congestion might not present a problem here (as they could on European autobahns). Therefore, you input 2-minute intervals after march units and 5-

FIGURE 9 - ACR MOVEMENT - ROUTE WEST 25 KM/HR

INPUT DATA FOR ROUTE: AS OF 19:10 3-May

A.	ROUTE NAME:	WEST		
B.	ROUTE LENGTH:	272	KM	
C.	START TIME OF FIRST VEHICLE:	18:00	HRS	9-May
D.	AVERAGE MARCH UNIT SPEED:	25	KM/HR	
E.	AVERAGE INTERVAL BETWEEN VEH:	50	MTRS	
F.	TIME AT REST HALTS:*	10	MINS	
G.	TIME BETWEEN REST HALTS (AFTER 1ST HOUR):	2	HRS	
H.	TIME AT ROM HALTS:	30	MINS	
I.	DISTANCE BETWEEN ROM HALTS:	200	KMS	
J.	TIME GAPS (BETWEEN SERIALS):	5	MINS	
K.	TIME GAPS (BETWEEN MU's):	2	MINS	
L.	EXTRA TIME ALLOWANCE (EXTAL):	2	MIN/25 VEH.	

* A 15 MIN REST HALT IS AUTOMATICALLY COMPUTED AFTER THE 1ST HOUR

INFORMATION FOR ROUTE: WEST

M.	TRAFFIC DENSITY WITHIN MARCH UNIT:	20	VEH/KM
N.	NUMBER OF REST STOPS ON ROUTE:	4	
O.	NUM. OF REFUELING STOPS (ROMS) ON ROUTE:	1	
P.	TOTAL DRIVING TIME PER VEHICLE:	10:52	HRS:MINS
Q.	REST AND/OR ROMS HALTS PER VEHICLE:	1:15	HRS:MINS
R.	TOTAL TIME OF TO CLOSE PER VEHICLE:	12:07	HRS:MINS
S.	TOTAL NUMBER OF SERIALS ON ROUTE:	4	SERIALS
T.	TOTAL NUMBER OF MARCH UNITS ON ROUTE:	35	MUs
U.	TOTAL NUMBER OF VEHICLES ON ROUTE:	833	VEHICLES

	UNIT	NO. SER	NO. MU	NO. VEH	TOT VEH	SP TIME	1ST VEH RP	LAST VEH RP
1.	1/208 ACR	1	3	22	66	18:00	6:07	6:25
2.	2/208 ACR	0	3	22	66	18:19	6:27	6:44
3.	208 HHT	0	1	20	20	18:38	6:46	6:50
4.	208 MI CO (-)	0	1	25	25	18:44	6:52	6:57
5.	208 ADA BTR (-)	0	1	28	28	18:51	6:59	7:04
6.	208 SPT SQN (-)	1	8	21	168	19:02	7:09	7:57
7.	500 ENG BN(DS)(-)	1	6	24	144	19:54	8:02	8:41
8.	2-637 FA BN (DS)	0	4	29	116	20:35	8:43	9:12
9.	52 MECH ADV. PRTY	1	8	25	200	21:09	9:17	10:11
10		0	0	0	0	0:00	0:00	0:00

COMMENTS:

208 HHT INFILTRATES WITH APPROX. 45 VEHICLES IN ADVANCE PARTY. (VEHICLES NOT REFLECTED IN MOVEMENT TABLES)

minute intervals between serials (figure 9, lines J and K) versus a longer interval if you thought traffic congestion a problem.

You also assume a ROM every 200 kilometers and a 15 minute rest break after the first hour with 10 minute rest breaks every 2 hours thereafter. Since your average march unit consists of 20-30 vehicles, you plan a 30 minute halt for each ROM (figure 9, lines F-I). Since this will constitute the first move in theater for any unit in the corps, you bump the EXTAL time up to 2 minutes per 25 vehicles (line L). EECT begins at 1800 hours on 9 May You choose this as your first vehicle start time[48] (line C). Looking at the results of your input, you determine that closure time for the entire convoy will not come until 1011 hours on ROUTE WEST. This exceeds BMCT (0640 hours). You decide to perform "what if" analysis.

You determine that if march unit speeds increase to 35 km/hr, closure times of the last vehicle on ROUTE WEST becomes 0626 hours (Figure 10, line 9). This time falls before the target BMCT time of 0640 hours. You also notice that total driving time per vehicle decreases from 10 hours and 52 minutes to 7 hours and 46 minutes (line P). The new input parameter also requires one less rest stop. You notice similar results on ROUTE EAST (not shown).

This 35 km/hr pace, however, exceeds standard practice. You believe three reasons warrant this decision: the ACR is experienced in moving; the terrain (flat) allows faster movements; and the percent illumination at night in the next week will exceed 85%. Therefore, the planned march unit speed for this particular night becomes 35 km/hr.

You now have time lines and sequencing established for the ACR. You move to step 9 of the approach and double check the output.

FIGURE 10 - ACR MOVEMENT - ROUTE WEST 35 KM/HR

INPUT DATA FOR ROUTE: AS OF 19:20 3-May

A.	ROUTE NAME:	WEST		
B.	ROUTE LENGTH:	272	KM	
C.	START TIME OF FIRST VEHICLE:	18:00	HRS	9-May
D.	AVERAGE MARCH UNIT SPEED:	35	KM/HR	
E.	AVERAGE INTERVAL BETWEEN VEH:	50	MTRS	
F.	TIME AT REST HALTS:*	10	MINS	
G.	TIME BETWEEN REST HALTS (AFTER 1ST HOUR):	2	HRS	
H.	TIME AT ROM HALTS:	30	MINS	
I.	DISTANCE BETWEEN ROM HALTS:	200	KMS	
J.	TIME GAPS (BETWEEN SERIALS):	5	MINS	
K.	TIME GAPS (BETWEEN MU's):	2	MINS	
L.	EXTRA TIME ALLOWANCE (EXTAL):	2	MIN/25 VEH.	

* A 15 MIN REST HALT IS AUTOMATICALLY COMPUTED AFTER THE 1ST HOUR

INFORMATION FOR ROUTE: WEST

M.	TRAFFIC DENSITY WITHIN MARCH UNIT:	20	VEH/KM
N.	NUMBER OF REST STOPS ON ROUTE:	3	
O.	NUM. OF REFUELING STOPS (ROMS) ON ROUTE:	1	
P.	TOTAL DRIVING TIME PER VEHICLE:	7:46	HRS:MINS
Q.	REST AND/OR ROMS HALTS PER VEHICLE:	1:05	HRS:MINS
R.	TOTAL TIME OF TO CLOSE PER VEHICLE:	8:51	HRS:MINS
S.	TOTAL NUMBER OF SERIALS ON ROUTE:	4	SERIALS
T.	TOTAL NUMBER OF MARCH UNITS ON ROUTE:	35	MUs
U.	TOTAL NUMBER OF VEHICLES ON ROUTE:	833	VEHICLES

	UNIT	NO. SER	NO. MU	NO. VEH	TOT VEH	SP TIME	1ST VEH RP	LAST VEH RP
1.	1/208 ACR	1	3	22	66	18:00	2:51	3:06
2.	2/208 ACR	0	3	22	66	18:16	3:08	3:23
3.	208 HHT	0	1	20	20	18:33	3:25	3:28
4.	208 MI CO (-)	0	1	25	25	18:39	3:30	3:34
5.	208 ADA BTR (-)	0	1	28	28	18:45	3:36	3:41
6.	208 SPT SQN (-)	1	8	21	168	18:54	3:46	4:28
7.	500 ENG BN(DS)(-)	1	6	24	144	19:41	4:33	5:06
8.	2-637 FA BN (DS)	0	4	29	116	20:17	5:08	5:34
9.	52 MECH ADV. PRTY	1	8	25	200	20:47	5:39	6:26
10		0	0	0	0	0:00	0:00	0:00

COMMENTS:

208 HHT INFILTRATES WITH APPROX. 45 VEHICLES IN ADVANCE PARTY.
(VEHICLES NOT REFLECTED IN MOVEMENT TABLES)

Does it pass the "make sense" test. You determine that the input parameters fall within reason or standard practice. You can account for all of the wheeled vehicles in the ACR (plus attachments). A total driving time of 8 hours and 51 minutes seems reasonable, especially since you have considered rest and ROM stops. All in all, your group decides that this "straw man" plan has some merit and represents a good base solution to build upon.

You continue determining movement times using the available data. You quickly develop alternatives using a variety of input assumptions. Moving the divisions looks difficult. You derive several courses of action. You continue to work until COL Smith returns. (Because of space constraints, this monograph will not present numerous movement options. Spreadsheet utilization, however, allows you to develop them quickly, methodically and uniformly.)

Upon COL Smith's return, you have a series of alternatives to present. You present unit locations, route selections and movement time-lines derived over the previous few hours. He makes several adjustments in the initial assumptions which require additional calculations. However, with your data base already set up, these adjustments require little time and effort on your part. When Col. Smith tells you to go with the Frag Orders, you can begin to disseminate initial guidance for the move. Although you know that staffing process provides many changes, you certainly have derived, *in a short amount of time*, a reasonable grasp on the broad issues and time lines associated with this move. When performing time-constrained planning at the operational level, this represents about as much as any planner can hope for.

CONCLUSIONS

> ..... the pre-World War II CGSC student, unlike his modern CGSC counterpart, did not skip the critical, interim step between the tactical and operational level of war--learning the time and distance factors involved in moving large formations over great distances. The CGSC graduates of the 1930's were thus able, during WWII, to draw from their educational backgrounds sufficient expertise in moving large units to be able to make such movements ... There is no reason why such movement planning could not once again be a part of the CGSC curriculum and be added to the SAMS curriculum.[49]

Surmounting distance in order to concentrate and mass forces is the reason for movement. Large unit movements require an initial "straw man" plan built to establish time lines and facilitate the backward planning process. The G-3 planner issues this initial product . In order to do so, he must conceptualize the move. He must establish priorities and provide the sequencing of events to achieve the desired end state. He must begin the staff coordination process.

In this process, time will always remain an important factor. Time remains non-retrievable. In order to facilitate parallel planning by other staff agencies and subordinate organizations, timely dissemination of concepts and ideas becomes critical. Operational level planning becomes especially time-sensitive when one considers the increased numbers of subordinate organizations that must first receive, conceptualize and then transmit their own plans and concepts of operations.

When considering movement in particular, the operational planner must have independent analytical skills in order to expeditiously perform "what if" analysis. He must promptly conceptualize the problem; obtain the pertinent data; apply the appropriate doctrine; and calculate the necessary

time/space relationships in order to assess the movement challenge and provide timely staff guidance to the operational decision maker.

The United States Army has fallen behind in its training of operational movement planners in the last 45 years. Prior to operation Desert Storm, the Army conducted few operations moving large formations. Since World War II, the size and scope of the problem has grown. The Army has failed to provide even rudimentary automation training to the officers attending its general staff schools. Automation is important. It quickly solves the numerous mathematical questions surrounding the movement problem.

History records many instances where the *way* to apply *means* to achieve an *end* was through operational movement. This movement seeks to support strategic objectives by properly sequencing resources in pursuit of tactical engagements. Planners who labor at the operational level of war have too many pressing problems. Movement planners must be knowledgeable of the procedures and the data and must be able to perform alternatives in an expeditious manner.

James Schneider postulates that twelve components specify the operational level of warfare.[30] Many of these components, such as distributed logistics, distributed campaigns, distributed operations and distributed maneuver, connotate distance, time and space. If one aspires to understand operational art, then one certainly must be able to comprehend and cope with its dispersed nature.

ANNEX A - INSTRUCTIONS FOR USE OF SPREADSHEET

GENERAL INFORMATION

1. Before you begin, ensure that you make one (Master) copy of this diskette. Set it aside.
2. Column H, Lines A thru L (Bold and Underlined) allow you to input data. (See Fig. 11)
3. Columns B,C,D and E, Lines 1 thru 10 (Bold and Underlined) allow you to input data.
4. All other lines and cells are calculated and present information to you.
5. This document is protected. Most cells cannot be changed without using a password.
6. The only cells that can be changed are the input data lines (Bold and Underlined).
7. Password for changing other cells is JACK. This will unprotect entire spreadsheet.

CELL SPECIFIC INFORMATION (SEE FIGURE 11 - NEXT PAGE)

8. (CELL H1,I1) - Time & date of spreadsheet start. Based on time set in your computer.
9. LINE A (CELL H3) - Route names can have up to 27 characters.
10. LINE B (CELL H4) - Route lengths entered in kilometers.
11. LINE C (CELL H5, J5) - Start time and date of move. See below.
    If you are using Microsoft Excel - Enter times directly (eg. 19:45).
    If you are using Lotus 1-2-3, you must enter them as a fraction (eg. 1975/2400).
12. LINE D (CELL H6) - Average speeds entered in kilometers per hour.
13. LINE E (CELL H7) - Average interval between vehicle entered in meters.
14. LINE F (CELL H8) - Rest halts entered in minutes. Spreadsheet automatically calculates 1st hour (15 minute) rest halt. You are entering subsequent rest halts.
15. LINE G (CELL H9) - Enter (in hours) the time interval that you wish to rest halt. Spreadsheet automatically calculates 1st hour rest halt. See instructions for Line F.
16. LINE H (CELL H10) - Enter (in minutes) average time to be spent at ROM halts
17. LINE I (CELL H11) - Enter (in kilometers) average distance between ROM halts.
    If you do not wish to ROM, ensure that this entry is larger than route length (Line B).
18. LINE J (CELL H12) - Enter time gaps between serials in minutes.
19. LINE K (CELL H13) - Enter time gaps between march units in minutes.
20. LINE L (CELL H14) - Enter EXTAL times in minutes.
21. LINE M (CELL H19) - Vehicle density calculated based on inputs from Line E.
22. LINE N (CELL H20) - Number of Rest Halts calculated based on Lines B, D and G.
23. LINE O (CELL H21) - Number of ROMs calculated based on Lines B, and I.
24. LINE P (CELL H22) - Driving time per vehicle calculated based on Lines B and D.
25. LINE Q (CELL H23) - Rest & Rom time per vehicle based on Lines F, H, N and O.
26. LINE R (CELL H24) - This is total time on route per vehicle. Sum of Lines P and Q.
27. LINE S (CELL H25) - Sum of number of serials entered in cells D32 through D41.
28. LINE T (CELL H26) - Sum of number of march units entered in cells E32 through E41.
29. LINE U (CELL H27) - Sum of number of vehicles entered in cells G32 through G41.
30. LINE 1-10 (CELLS C32-C41) - Enter unit names. Called "identified unit" (below).
31. LINE 1-10 (CELLS D32-D41) - Enter numbers of serials per identified unit here.
    If you plan on moving this unit as part of another serial, you may enter a "0" here.
32. LINE 1-10 (CELLS E32-E41) - Enter numbers of march units per serial here.
33. LINE 1-10 (CELLS F32-F41) - Enter number of vehicles per march unit.
34. LINE 1-10 (CELLS G32-G41) - Calculates total vehicles per identified unit.
35. LINE 1-10 (CELLS H32-H41) - Calculates first vehicle SP time per identified unit.
36. LINE 1-10 (CELLS I32-I41) - Calculates first vehicle RP time per identified unit.
37. LINE 1-10 (CELLS J32-J41) - Calculates first vehicle start time per identified unit.

FIGURE 11 - SPREADSHEET HIGHLIGHTED BY CELL

INPUT DATA FOR ROUTE: CELL H1 CELL I1

A.	ROUTE NAME:	CELL H3		
B.	ROUTE LENGTH:	CELL H4	KM	
C.	START TIME OF FIRST VEHICLE:	CELL H5	HRS	CELL J5
D.	AVERAGE MARCH UNIT SPEED:	CELL H6	KM/HR	
E.	AVERAGE INTERVAL BETWEEN VEH:	CELL H7	MTRS	
F.	TIME AT REST HALTS:*	CELL H8	MINS	
G.	TIME BETWEEN REST HALTS (AFTER 1ST HOUR):	CELL H9	HRS	
H.	TIME AT ROM HALTS:	CELL H10	MINS	
I.	DISTANCE BETWEEN ROM HALTS:	CELL H11	KMS	
J.	TIME GAPS (BETWEEN SERIALS):	CELL H12	MINS	
K.	TIME GAPS (BETWEEN MU's):	CELL H13	MINS	
L.	EXTRA TIME ALLOWANCE (EXTAL):	CELL H14	MIN/25 VEH.	

* A 15 MIN REST HALT IS AUTOMATICALLY COMPUTED AFTER THE 1ST HOUR

INFORMATION FOR ROUTE: WEST

M.	TRAFFIC DENSITY WITHIN MARCH UNIT:	CELL H19	VEH/KM
N.	NUMBER OF REST STOPS ON ROUTE:	CELL H20	
O.	NUM. OF REFUELING STOPS (ROMS) ON ROUTE:	CELL H21	
P.	TOTAL DRIVING TIME PER VEHICLE:	CELL H22	HRS:MINS
Q.	REST AND/OR ROMS HALTS PER VEHICLE:	CELL H23	HRS:MINS
R.	TOTAL TIME OF TO CLOSE PER VEHICLE:	CELL H24	HRS:MINS
S.	TOTAL NUMBER OF SERIALS ON ROUTE:	CELL H25	SERIALS
T.	TOTAL NUMBER OF MARCH UNITS ON ROUTE:	CELL H26	MUs
U.	TOTAL NUMBER OF VEHICLES ON ROUTE:	CELL H27	VEHICLES

	UNIT	NO. SER	NO. MU	NO. VEH	TOT VEH	SP TIME	1ST VEH RP	LAST VEH RP
1.	CELL C32	D32	E32	F32	G32	H32	I32	J32
2.	CELL C33	D33	E33	F33	G33	H33	I33	J33
3.	CELL C34	D34	E34	F34	G34	H34	I34	J34
4.	CELL C35	D35	E35	F35	G35	H35	I35	J35
5.	CELL C36	D36	E36	F36	G36	H36	I36	J36
6.	CELL C37	D37	E37	F37	G37	H37	I37	J37
7.	CELL C38	D38	E38	F38	G38	H38	I38	J38
8.	CELL C39	D39	E39	F39	G39	H39	I39	J39
9.	CELL C40	D40	E40	F40	G40	H40	I40	J40
10	CELL C41	D41	E41	F41	G41	H41	I41	J41

COMMENTS:

SPACE IS PROVIDED AT BOTTOM OF SPREADSHEET FOR NOTES AND COMMENTS

END NOTES

1 Sun Tzu, The Art of War, translated by Samuel B. Griffith, (New York: Oxford University of Press, 1971) p. 96.

2 Federal Republic of Germany, Ministry of Defense, "Operational Guideline for the Operational Command and Control of Land Forces in Central Europe," 1987, p 10.

3 U.S. Department of the Army, Blueprint of the Battlefield, TRADOC Pam 11-9, (Fort Monroe, VA.: Army Training and Doctrine Command, 27 April 1990) p. 42.

4 TRADOC Pam 11-9 p. 42.

5 TRADOC Pam 11-9 p. 42.

6 U.S. Department of the Army, Operations, Field Manual 100-5. (Washington, D.C.: U.S. Government Printing Office, 1986) p. 175.

7 TRADOC Pam 11-9 p. 42.

8 Karl Von Clausewitz, On War, (Princeton: Princeton University Press, 1976), p. 319.

9 Kindsvatter, Major Peter S, "An Appreciation for Moving the Heavy Corps -- The First Step in Learning the Art of Operational Maneuver", (SAMS Monograph, May 1986), p. 12.

10 U.S. Army Command and General Staff College, Airland Battle Sustainment Doctrine (Division and Corps), Student Text 63-1. (Fort Leavenworth, KS, 1989) p. 5-7.

11 LTC Walter T. Brown, "Movement Control, The Quiet Combat Multiplier", Army Logistician, (Fort Lee, VA., July-August 1990), p. 10.

12 U.S. Army Command and General Staff College, Staff Officers Handbook, Field Circular 101-5-2. (Fort Leavenworth, KS, March 1987) p. 1-11.

13 "Moving the Heavy Corps," p. 28.

14 U.S. Department of the Army, Operational Terms and Symbols, Field Manual 101-5-1, (Washington, D.C.: U.S. Government Printing Office, October 1985) p. 1-6.

15 One of Von Moltke's most famous sayings was that virtually anything in a battle could be overcome except the initial misplacement of forces.

16 Perhaps the most conspicuous example comes from the invasion of Normandy during operation OVERLORD. Since United States forces embarked from ports in southern England, they landed on beaches in western Normandy. The British and Canadians came from northern England to the eastern beaches of Normandy. This facilitated a tidy SEALOC. It did not, however, enhance the inherent advantages of the two allied armies. The U.S. forces had more available manpower and equipment and therefore should have been assigned the terrain allowing for the greatest degree of freedom for operational maneuver. This was to be found by going past Cain. Instead, their beachhead lead directly into the bocage and their superior potential for mobility was neutralized. The British and Canadians inherited the breakthrough terrain, but could not fully exploit it due to limitations in sustainment of manpower (in particular) and equipment.

17 U.S. Department of the Army, The Soviet Army Operations and Tactics, Field Manual 100-2-1, (Washington, D.C.: U.S. Government Printing Office, 16 July 1984) p. 6-7. Based on Soviet battalion frontage in the defense.

18 Field Manual 100-2-1, p. 5-19. Based on Soviet divisional frontage in the offense.

19 Field Manual 100-2-1, p. 6-6. Based on Soviet regimental frontage in the defense.

20 Field Manual 100-2-1, p. 4-4. Based on Soviet Army frontage in the offense.

21 Field Manual 100-2-1, p. 6-6. Based on Soviet divisional frontage in the defense.

22 Field Manual 100-2-1, p. 4-4. Based on Soviet Front frontage in the offense.

23 U.S. Department of the Army, G-4 Battle Book, Command and General Staff College Student Text 101-6, Fort Leavenworth, Kansas, 1 June 1989, p. D-1.

24 G-4 Battle Book, p. D-1.

25 Field Manual 101-5-1, p. 1-44.

26 U.S. Department of the Army, Army Motor Transport, Units and Operations, Field Manual 55-30, (Washington, D.C.: U.S. Government Printing Office, 27 December 1984) p. 4-4.

27 Field Manual 55-30, p. E-2.

28 Field Manual 101-5-1 p. 1-61.

29 Field Manual 101-5-1 p. 1-67.

30 Field Manual 55-30, p. 4-8.

31 "An Appreciation for Moving the Heavy Corps -- The First Step in Learning the Art of Operational Maneuver", p. 47-54.

32 III Corps Maneuver Booklet, (May 87), P. 39.

33 U.S. Department of the Army, Cavalry Operations, Field Manual 17-95, (Washington, D.C. : U.S. Government Printing Office, 14 February, 1986) p. B-32.

34 III Corps Maneuver Booklet, P. 40.

35 U.S. Department of the Army, Transportation Reference Data, Field Manual 55-15, (Washington, D.C.: U.S. Government Printing Office, 9 June 1986) p. 3-55.

36 III Corps Maneuver Booklet, P. 40.

37 Cavalry Operations, p. B-41.

38 III Corps Maneuver Booklet, P. 40.

39 Cavalry Operations, p. B-34.

40 Field Manual 55-15, p. 3-70 to 3-73. The exception here being the M911, 22 1/2T Truck, Tractor, which has a cruising range of about 280 km.

41 U.S. Department of the Army, Corps Operations, FM 100-15, (Washington, D.C. U.S. Government Printing Office, September 1989), p. 7-12.

42 Kindsvatter, Major Peter S, "An Appreciation for Moving the Heavy Corps -- The First Step in Learning the Art of Operational Maneuver", (SAMS Monograph, May 1986), p. 12. Kindsvatter's research indicates that the Patton's Third Army issued a one page directive on the second day (20 December, 1944) of a three day move (19-21 December), although planning may have begun as much as three days earlier (17 December).

43 Antoine Henri Jomini, "The Art of War" in Roots of Strategy, (Book 2, Harrisburg, PA: Stockpole Books 1987) p. 461. The quote provided represents one of four maxims of Jomini's Fundamental Principle of War.

44 This number is calculated be assuming 561 tracked vehicles for the ACR, 18 tracked vehicles for the DS engineer battalion, 77 tracked vehicles for the DS

155 SP FA battalion and 0 tracked vehicles each for the follow-on divisional advance parties. (561+18+77 = 656)

45 During Operation Desert Shield, one of the top logistical priorities was deploying over 1200 HET's to Saudi Arabia. C-5 transport plans were used to bring some units from CONUS--a very expensive undertaking.

46 U.S. Department of the Army, G-4 Battle Book, (Command and General Staff College Student Text 101-6. Fort Leavenworth, Kansas. 1 June 1989), p. 2-10.

47 This number is calculated be assuming 1023 vehicles for the ACR, 196 wheeled vehicles for the DS engineer battalion, 117 wheeled vehicles for the DS 155 SP FA battalion and 200 wheeled vehicles each for the follow-on divisional advance parties. (1023+196+117+200+200 = 1736)

48 U.S. Department of the Army, U.S. Army Air Defense Operations, Field Manual 44-100, (Washington, D.C.: U.S. Government Printing Office, 22 November 1988) p. A-3. Since BMNT and EENT represent times when a soldier is visible at 100 meters, you are more interested here in BMCT and EECT and percent illumination data.

49 "An Appreciation for Moving the Heavy Corps -- The First Step in Learning the Art of Operational Maneuver", p. 37.

50 James J. Schneider, "The Loose Marble -- and the Origins of Operational Art," Parameters, March 1989, p. 90.

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